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MEMORANDUM

ON THE

JHELUM SALT RANGE AND ITS VICINITY.

COMPILED ON THE OCCASION OF THE VISIT OF HIS EXCELLENCY THE VICEROY IN NOVEMBER 1882.

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THE

JHELUM DISTRICT

AND

SALT RANGE.

I.—GEOGRAPHICAL.

NTRODUCTION.

THE district of Jhelum is bounded on the east by the river of the same name; on the north by the district of Rawalpindi; on the west by that of Bannu; the south by the district of Shahpur and the river Jhelum, which, leaving the hills, turns sharply westwards. The greatest width of e district from north to south is 44 miles, and its length 116 miles m east to west. The total area is 3,909 square miles, and the total pulation, according to the census of 1881, 589,373 souls, or 128·13 r square mile. It lies between the parallels of Lat. 32° 26′ 12″ and ° 14′ 48″, and Long. 71° 51′ 45″ and 73° 51′. For administrative rposes it is divided into 4 sub-divisions ('tahsils'), having their ad-quarters, respectively, at the towns of Jhelum, Pind Dadan Khan, akowal, and Talagang. The head-quarters of the district are at e town of Jhelum on the river of the same name, near the eastern tremity of the district. The land revenue demand of the district nounted to about Rs. 730,000.

2. "There are probably few districts in the Punjab," wrote the Setement Officer, Mr. A. Brandreth, who was well acquainted with the elum district, "which offer greater temptations for a long report than elum. Lofty hills, rich valleys, and mines of salt yielding a third of a illion annually, mark it as quite distinct, physically, from all other disicts in the plains. But the great difference is in the people, their races, and eir customs. Here are the once illustrious Janjuahs, the only pure ajputs left in the Punjab plains, whose Chiefs still retain their empty les of Sultan and Diwan, Malik and Raja. Here is the ancient home of e celebrated Ghakkars, the redoubted opponents of so many of the uhammadan invaders. Here are Gujars—no longer a pastoral and ieving race, but—the best cultivators of the district, proud of the

memories of the ancient chaudhris of Kala. The Jats here are a Mussalmans, firm friends of British rule, and grateful for deliveranc from the oppressions of their Sikh brethren. More curious than a these is the great Awan tribe, a race of unknown origin and unknow history, who have spread from the west like an overflowing torren dispossessing alike Janjuah, Jat and Ghakkar.

Description would require a second Major Tod.

3. "The histories, the manners, and the peculiarities of these tribes, marked as they are by so many feudal customs, would well employ the pen of a second Major Tod; and the extraordinary ruins of ancient times, the very traditions of which have died away,—mixed with oth still claimed to this day by the descendants of their former possessors would have given ample employment for his pencil.

History would fill a volume.

4. "Above all, the history of this remarkable tract, the pathway all the invaders of India, from the Macedon conqueror to the last Mussalman destroy would afford materials for a volume, far m interesting than any tales of English measurements, suits a assessments. Here it was that Alexander fought with Porus, a built his celebrated fleet. Jhelum itself has been supposed to be t city of Nicæa while (on the other hand) the peculiar gorge above Jal pur, the only natural route practicable for cannon, is even now alwa spoken of as the work of Sultan Secunder.

Traditions.

5. "It was in this district, and in the neighbouring one of Raw pindi, that the Mythological Pandus are said have taken refuge, and every remarkable place arou the holy waters of Katas teems with traditions of these ancient Rajp Princes. The hosts of Janghis Khan were repulsed and India saved this neighbourhood. Timurlang records his visits to the hills of Jod and any of the old men will recount the traditions of Malik Hast, Janjuah ally, and Sultans Hathi and Tatar, the former the Ghakk opponent of Baber, the Indian Alexander.

Tales of Mussalman Emperors.

6. "Rotas, the great fort begun by Sher Shah to prevent t return of Baber's son (who returned to fini it for him), is in this district. This wond ful fortification, circling the rocks commandi the entrance to the Kuhan Pass, with its massive walls of solid maso (in many places between 30 and 40 feet thick), extending for th

miles, seems rather the work of some ancient Rama, and his attendant demi-gods, than of ordinary mortals. Shah Jehan's grandson, Bahadur Shah, returned by this route to depose his usurping brother, and it was as a punishment for the little aid he received from the Chiefs here that he deprived them of most of their privileges, degrading them into simple land-owners, a position which Sikh exactions rendered so entirely nominal that, under our system, they have often lost it entirely.

Result of Sikh oppression.

7. "Many are the tales of the devastations of Nadir Shah and Ahmed Shah. But their visitations were but temporary. It was the rule of the Sikh Kardars too far off from Lahore to be under any check, which reduced the Rajput and the Ghakkar alike to their present state of poverty, so that they are now often compelled to become tenants under their former ploughmen.

General features of the district.

8. "The river Jhelum, for some 130 miles below the Himalayas," writes the compiler of the *Gazetteer* of the Jhelum district, "forms the boundary of two distinct geographical zones. Below it are the level plains of the Punjab Proper, while beyond it, to the north, a region of hills and rugged, broken ground stretches as far as the Indus and the mountains which form the north-west boundary of the Empire. Immediately above the banks of the Jhelum rises the Salt Range, and beyond it there commences an elevated plateau cut up in every direction with innumerable ravines and fissures, rising here and there into low hills, and blending towards the north with the mountains of the Rawalpindi district. The prominent features of the Jhelum district, it will be seen from what has been already stated, are the Salt Range running throughout its length from east to west; below it, to the south, a narrow plain sloping down to the river bank, and to the north a tableland intersected everywhere with ravines, so rough and precipitous that barely one-third of its area is fit for cultivation.

The Salt Range.

9. "The main body of the Salt Range commences about 40 miles from the eastern boundary of the district in the lofty hill of Chel, 3,701 feet above the sea, and the highest point within the district. In this hill unite three spurs, running from the eastward. The first two rise nearly due east from the Chel, and may be considered connecting links between the Himalayas and the Salt Range, being divided from the former only by the bed of the Jhelum. The northern of these spurs rises abruptly from

the fort over the rich and fertile lands, watered by perennial springs, rapid enough to work many of the little native water-mills; the extensive ruins of the great city and fort of Makhiala, the royal fort or residence of the Chief or Sultan of the western Janjuahs; the gardens of Suloi; the strangely precipitous rock, crowned by the fort of Kusak, where Ranjit Singh besieged the last Chief of the Janjuahs for nearly six months in vain, till he had to surrender from want of water—to gradually descend in position year by year, till the present Sultan is a mere pensioner of Government, whose pension expires on his death; the gardens of Choya; the old fort of another Janjuah Chief, now the English Officer's bungalow, on the Dalur Hill; the lofty hill of Chel, a great place of pilgrimage, from which you can see almost the whole of the district; the steep of Kurungal crowned with the lines and bastions which gave shelter to another branch of Janjuahs, contented to take a larger share of the lands, and not to claim a share in the royal title. All these I would gladly write about, but even then more would be left.

13. "Katas and Malot deserve separate mention. Katas is one of the holy spots of India, and is mentioned in the Mahabharat as the Eye of the World. It is the Hardwar or Prayag of the Punjab, and annually draws a vast number of pilgrims from all parts of the province. The great Mussalman mela at the tomb of Sydan Shah occurs the next day only a mile off, so that the concourse is often estimated at from fifty to sixty thousand; indeed, in fortunate years, when grain was cheap and plentiful, a lakh of persons are said to have assembled. This place, which attracts so much veneration, is a small square tank hollowed out and built up in the limestone rock. The water is said to be unfathomable in the centre, though I believe it has been found to be 26 feet deep. It is fed by an underground spring, which, overflowing, fertilizes the village of Choya, and then passing through by salt mines of Makrach, under a fort called the Rotas Fort (not the great Rotas), becomes salt, and lays waste all the land on both sides of it in the plains below. This water is full of thousands of little fishes, which each devotee is expected to feed. They never become large, as they are washed out of the tank in the rains into the deep pools of the stream below. This tank is surrounded by numerous pakka houses of the Chief Sikh Sardars and Rajas, and by the fortified buildings of the Gosains and Sunyassis, who used in former days to fight bitterly for the supremacy here. On one side at

Special account of Katas.

some distance is a very holy spot. It is a temple of the peculiar Kunyat stone, which is a highly porous sort of limestone, formed apparently entirely of petrifactions deposited by the hill-waters. It cuts well, and is very durable. This temple is 3 storeys high, but small; each storey contains a small inner room with a very narrow passage round. It is said to have been built by the Pandus, and a subterranean passage, now in ruins, is shown as leading to the place where they hid. Another holy spot on the opposite side is a deep cave, where a peculiar shaped piece of rock is said to be part of the cow which supports the world. No pilgrim leaves Katas without an offering to this cow, and it was probably disputes concerning the division of the collections there which led to the fighting of the two classes of fakirs, as above mentioned. The temple is certainly old, belonging to the Buddhist period; it is supported by two smaller temples, now much ruined, and has a courtyard like the Kashmir temples.

Account of Malot.

14. "Malot is quite a different place. The temple there is older and finer, having some very remarkable fluted Ionic or Bactrian columns on each front. It has been carefully drawn and described in the Asiatic Researches, and is probably at least 2,000 years old. Its site is most remarkable. Placed almost on the edge of one of the most stupendous precipices of the range, and projecting somewhat from the general line, it commands one of the most extensive views to be found in the Salt Range over the Jhelum, the Chenab and possibly the Ravi, with the mountain of the Koh Karana, in the Shahpur district, in the centre of the view. This village of Malot is the ancestral village of all the Janjuahs, and the Chief, now a simple lambardar, never gave a daughter to any other Janjuah even, till very lately, when poverty had humbled his pride of ancestry. The hill is crowned by a fort, built by Maha Singh, Ranjit Singh's father.

Salt Mines.

15. "The salt mines have been so often described that an allusion to them is sufficient. Each was formerly the property of one of these Janjuah Chiefs, who were compensated by the Sikhs with various grants, as royalties. These Maharaja Gulab Singh almost extinguished. They have now ceased entirely, as they always latterly had to render service for these grants, and this service we have now no need for. The Jutana mine was a favourite, though a small mine, and is now closed. The Khewra mine is the one chiefly used as most accessible for camels;—the road to Makrach,

the other large mine, is so bad (Mr. Brandreth writes in 1862) that till lately many camels were annually killed or lamed on it. The approach to the Sardi mine is so difficult that all the salt has to be taken from it on bullocks lightly laden. The revenue we derive from the salt is much over ¼ of a million sterling annually, and if we allowed 1 or 2 per cent. to be spent on improving the roads, we could easily add 10 per cent to the revenue. The salt is found in a thick stratum under the red or pink earth in the gorges mentioned above, and with a good deal of gypsum about it. It is hollowed out on vast arches some 30 and 40 feet span. The lumps are now generally detached by blasting, which has reduced the cost of production to a minimum. A capital road has been made up to the Khewra mine, and the great entrance and air shafts are works of our rule. Formerly the miners crept in by a hole into a stifling cavern and laboriously cut out pieces of salt with a pick-axe. The work was thus entirely confined to one caste, who could dictate their own terms; now any ordinary laborer can work there.

The plains below the Range—description of them, and assessment circles.

1. Villages below hills irrigated by rain.

2. Villages irrigated by wells.

3 Villages irrigated by the river.

4. Some villages belong to all 3 circles.

16. "The plains below the Salt Range between the hills and the river contain the most fertile and the wealthiest villages in the district; east of Pind Dadan Khan they are divided into 3 distinct tracts; villages just below the hills where no wells can be sunk; the intermediate villages, which are the Charkari Mahal, or well tract, of the district; and the villages along the river bank, where the greater part of the land is too moist from the river-floods to need many wells. Of course in this narrow tract some villages stretch right across and have lands belonging to all three tracts. But as a general rule the division is well marked.

Cultivation in villages below hills.

17. "The villages under the hills where wells cannot be sunk are nevertheless very rich and fertile. They receive the accumulated water of the hill-slopes, the course of which they detain by lofty banks of earth. These detain the water long enough to thoroughly fertilize the field, and then, breaking, let the water pass into the next one. Very little water gets beyond these villages except in unusual floods. At first the water is rather salt; but after the surface soil has been washed, it is pure rain water with just enough earth and salts to renovate the fields annually. If the rain is not sufficient, it leaves a salt deposit and destroys that harvest.

This however does not often happen, as a slight shower is all absorbed by the hill, and sends down nothing to these villages. It is this which makes the villages so prosperous and able also to pay such good assessments. Amongst these, the villages near Pind Dadan Khan, called the Phupra villages, are large flourishing villages of 3,000 and 6,000 acres each, and are the most prosperous as the most industrious.

Account of villages in the tracts nearer the river.

18. "The salt which these villages escape seems to collect in the villages of the middle tract, and year by year one or two wells are reported useless from salt accumulation. There are however more than 300 wells in the 15 villages east of Pind Dadan Khan, and more are being sunk every year; so that it will be some time before the tract deteriorates materially. The soil here has also changed. In the villages under the hills it is chiefly a reddish hard earth, which to the casual observer does not seem very fertile. In these villages it is a black pulverulent soil of the highest fertility, but becoming mixed with a good deal of sand as it approaches the river. The fertility of the soil, and the absence of ravines and unculturable land render these villages capable of supporting a large surplus population. This, together with the very large area of each village, accounts for the great number of really large and important townships in this tract. The soil near the river is more sandy, and the moisture of the river affords an excuse for not making wells; and consequently the villages are neither so industrious nor so prosperous as those where the continued labor required for the well developes different habits, though there are some villages which are a marked exception.

Vugh Valley.

19. "These villages thus described constitute the ilaqas of Jalalpur, Jalub, and Pind Dadan Khan, with the exception of a picturesque village called Vugh, which, with its subordinate villages, lies north of Jalalpur, in a fertile valley sloping down from the hills (which enclose it like the letter V) to the Boonna Naddi."

II.—HISTORICAL.

20. Of the historical associations of the Salt Range, the most interesting is that of Alexander the Great. It seems beyond doubt that the Greeks crossed the Jhelum river at or near Jalalpur, and next morning attacked and defeated the army of Porus at Nicæa, which has been identified with the village of Mung.

Town of Jalalpur.

21. The town of Jalalpur is situated on the west bank of the Jhelum at the point where the Kandar ravine joins the old bed of the river. The stream is now 2 miles distant, but the intervening ground, though partially covered with small trees, is still very sandy. General Cunningham, R. E., writes in the Ancient Geography of India:—" Its old Hindu name is said to have been *Girjak*, and as this name is found in Abul Fazl's 'Ayin-i-Akbari' as *Kerchak* (read *Girjak*) of Sind Sagar, we have a proof that it was in use until the time of Akbar, when it was changed to Jalalpur. But the people still apply the name of *Girjak* to the remains of walls on the top of the Mangal-De Hill, which rises 1,100 feet above Jalalpur. According to tradition, *Girjak* extended to the west-north-west as far as the old temple of Baghanwala, a distance of 11 miles. But this is only the usual exaggeration of ignorance that is told of all ancient sites. There is no doubt that the city did once extend to the westward for some considerable distance, as the ground on that side is thickly strewn with broken pottery for about half a mile. Its antiquity is undoubted, as the coins which it yields reach back to the times of Alexander's successors. But it is much older, as its favorable position at the south-east end of the lower road would certainly have led to its occupation at a very early period, and therefore it may be identified with the *Girivraja* of the Ramayana.

Course of river from Jhelum to Jalalpur.

22. " From Jhelum to Jalalpur the course of the river is from north-east to south-west, between two nearly parallel ranges of mountains, which are generally known as the Tilla and Pabbi Hills. The Tilla Range, which is about 30 miles in length, occupies the west bank from the great east bend of the river below Mangala, to the bed of the Boonna river, 12 miles to the north of Jalalpur. *Tilla* means simply a 'peak or hill,' and the full name is *Gorakhnath-ka-Tilla*. The more ancient name was *Balnath-ka-Tilla*.

23. " Abul Fazl also mentions the 'Cell of Balnat,' and the atten-

dant *Jogis* or devotees, from whom the hill is still sometimes called *Jogi-Tilla.* But the name of Balnath is most probably even older than the time of Alexander, as Plutarch relates that, when Porus was assembling his troops to oppose Alexander, the royal elephant rushed up a hill sacred to the sun, and in human accents exclaimed, ' O great king, who art descended from *Gegasios,* forbear all opposition to Alexander, for *Gegasios* himself was also of the race of Jove !'

24. "The ' Hill of the Sun' is only a literal translation of *Balnath-ka-Tilla,* but Plutarch goes on to say that it was afterwards called the ' Hill of the Elephant,' which is another proof of its identity with Balnath ; for as this name is commonly pronounced *Bilnat* by the people, and is so written by Mogal Beg, the Macedonians, who had just come through Persia, would almost certainly have mistaken it for *Fil-nath,* or *Pil-nath,* the ' Elephant ;' but wherever Alexander's camp may have been, whether at Jhelum or Jalalpur, this remarkable hill, which is the most commanding object within 50 miles of the Hydaspes, must certainly have attracted the attention of the Macedonians. Its highest peak is 3,242 feet above the sea, or about 2,500 feet above the level of the river.

25. " We have now to examine how the river and the country about Jalalpur will agree with the recorded accounts of Alexander's operations in his passage of the Hydaspes and subsequent battle with Porus. According to Arrian* ' there was a high-wooded promontory on the bank of the river, 150 stadia, or just 17¼ miles above the camp, and immediately opposite to it there was a thickly-wooded island.' Curtius† also mentions the wooded island as ' well fitted for masking his operations.' ' There was also,' he adds, ' not far from the spot where he was encamped, a very deep ravine (*fossa præalta*), which not only screened the infantry but the cavalry too.' We learn from Arrian‡ that this ravine was not near the river because ' Alexander marched at *some distance from the bank,* lest the enemy should discern that he was hastening towards the promontory and island.' Now there is a ravine to the north of Jalalpur which exactly suits the descriptions of both historians. This ravine is the bed of the Kandar Nala, which has a course of 6 miles from its

Country round Jalalpur.

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* Anabasis, v. 11.

† Vita Alex., viii. 13, " tegend is insidiis apta."

‡ ' Anaba[illegible]s,' v. 12.

source down to Jalalpur, where it is lost in a waste of sand. Up this ravine there has always been a passable but difficult road towards Jhelum. From the head of the Kandar, which is 1,080 feet above the sea, and 345 above the river, this road proceeds for 3 miles in a northerly direction down another ravine called the Kasi, which then turns suddenly to the east for 6½ miles, and then again 1½ mile to the south, where it joins the Jhelum immediately below Dilawar, the whole distance from Jalalpur being exactly 17 miles. The ravine lies 'at some distance from the bank,' as described by Arrian, as the bend in the Kasi is 7 miles from the Jhelum. It is also 'a very deep ravine,' as described by Curtius, as the hills on each hand rise from 100 to 250 and 300 feet in height. Therefore, in the three leading particulars which are recorded of it, this ravine agrees most precisely with the accounts of the ancient historians.

Description of Alexander's camp.

26. "Amongst the minor particulars, there is one which seems to me to be applicable only to that part of the river immediately above Jalalpur. Arrian records that Alexander placed running sentries along the bank of the river, at such distances that they could see each other, and communicate his orders. Now, this operation could not be carried out in the face of an observant enemy along any part of the river bank, excepting only that one part which lies between Jalalpur and Dilawar. In all other parts the west bank is open and exposed, but in this part alone the wooded and rocky hills slope down to the river, and offer sufficient cover for the concealment of single sentries. As the distance along the river bank is less than 10 miles, and was probably not more than 7 miles from the east end of the camp, it is easy to understand why Alexander placed them along this line instead of leaving them on the much longer route, which he was to march himself. Another minor particular is the presence of a rock in the channel by the river, on which, according to Curtius, one of the boats was dashed by the stream. Now, rocks are still to be found in the river only at Kotera, Meriala, Malikpur, and Shah Kabir, all of which places are between Dilawar and Jalalpur. The village of Kotera is situated at the end of a long wooded spur, which juts out upon the river just one mile below Dilawar. This wooded jutting spur, with its adjacent rock, is identified with the *akra*, or promontory of Arrian, and the *petra* of Curtius.* Beyond the

* Curtius, Vita Alex., viii 11, "Unâ ergo navi, quam petræ fluctus illiserat, hærente cæteræ evadunt."

rock there was a large wooded island which screened the foot of the promontory from the observation of the opposite bank. There are many islands in this part of the Jhelum, but when a single year is sufficient to destroy any one of these rapidly-formed sandbanks, we cannot, after the lapse of more than 2,000 years, reasonably expect to find the island of Alexander. But in 1849, opposite Kotera, there was such an island, 2½ miles in length and half a mile in breadth, which still exists as a large sandbank. As the passage was made in the height of the rainy season, the island, or large sandbank, would naturally have been covered with tamarisk bushes, which would have been sufficiently high to screen the movements of infantry and dismounted cavalry.

27. "The position of the two camps was probably as follows:— Alexander, with about 50,000 men, including 5,000 Indian auxiliaries under Mophis of Taxila, had his head-quarters at Jalalpur, and his camp probably extended for about 6 miles along the bank of the river, from Shah Kabir, 2 miles to the north-east of Jalalpur, down to Syadpur, 4 miles to the west-south-west. The head-quarters of Porus must have been about Muhabatpur, 4 miles to the west-south-west of Mung, and 3 miles to the south-east of Jalalpur. His army of nearly 50,000 men, including elephant-riders, archers, and charioteers, must have occupied about the same extent as the Macedonian army, and would, therefore, have extended about 2 miles above, and 4 miles below Muhabatpur. In these positions, the left flank of Alexander's camp would have been only 6 miles from the wooded promontory of Kotera, where he intended to steal his passage across the river, and the right flank of the Indian camp would have been 2 miles from Mung, and 6 miles from the point opposite Kotera.

28. "As the present object is to identify the scene of Alexander's battle with Porus, and not to describe the fluctuations of the conflict, it will be sufficient to quote the concise account of the operation which is given by Plutarch from Alexander's own letters:—'He took advantage of a dark and stormy night, with part of his infantry and a select body of cavalry, to gain a little island in the river, at some distance from the Indians; when he was there, he and his troops were attacked with a most violent wind and rain, accompanied with dreadful thunder and lightning.' But in spite of the storm and rain, they pushed on, and, wading through the water breast-high, reached the opposite bank of the river in safety.

Night passage of the river.

'When they were landed,' says Plutarch,* who is still quoting Alexander's letters, he 'advanced with the horse 20 stadia before the foot, concluding that if the enemy attacked him with their cavalry he should be greatly their superior, and that if they made a movement with their infantry his own would come up in time enough to receive them.' From Arrian† we learn that, as soon as the army had begun fording the channel, between the island and the mainland, they were seen by the Indian scouts, who at once dashed off to inform Porus. When the ford was passed with some difficulty, Alexander halted to form his little army of 6,000 infantry and about 10,000 cavalry. He then 'marched swiftly forward with 5,000 horse, leaving the infantry to follow him leisurely and in order.' While this was going on, Porus had detached his son with 2 or 3,000 horse and 120 chariots to oppose Alexander. The two forces met at 20 stadia, or 2¼ miles, from the place of crossing, or about 2 miles to the north-east of Mung. Here the chariots proved useless on the wet and slippery clay, and were nearly all captured. The conflict, however, must have been a sharp one, as Alexander's favorite charger, Bukephalus, was mortally wounded by the young Prince, who was himself slain, together with 400 of his men. When Porus heard of the death of his son, he marched at once against Alexander with the greater part of his army; but when he came to a plain, where the ground was not difficult and slippery, but firm and sandy, and fitted for the evolution of his chariots, he halted and arrayed his troops ready for battle. His 200 elephants were drawn up in front of the infantry about one *plethron*, or 100 feet apart, and the chariots and cavalry were placed on the flanks. By this arrangement, the front of the army facing north-east must have occupied an extent of about 4 miles, from the bank of the river to near Lakhnawali, the centre of the line being, as nearly as possible, on the site of the present town of Mung. Around this place the soil is 'firm and sound;' but towards the north-east, where Alexander encountered the young Indian Prince, the surface is covered with a hard red clay, which becomes both heavy and slippery after rain. I speak from actual observation of the field of Chilianwala for some days

Battle with Porus.

* 'Life of Alexander.' Sir W. Napier has paid a just tribute to the skill of both Generals. Speaking of Alexander's passage of the Granicus, he says that it cannot "be compared for soldierly skill with his after passage of the Hydaspes, and defeat of Porus. Before that great man he could not play the same daring game." ('London and Westminster Review,' 1838, p. 377.)

† 'Anabasis,' v. 13.

after the battle, when the country had been deluged with rain. Both battles were fought on the same ground, between the town of Mung and the southern end of the Pabbi Hills.

29. "When Alexander saw the Indian army drawn up in battle array, he halted to wait for his infantry, and to reconnoitre the enemy's position. As he was much superior to Porus in cavalry, he resolved not to attack the centre, where the formidable line of elephants were supported by masses of infantry, but to fall upon both flanks and throw the Indians into disorder. The right wing, led by Alexander himself, drove back the enemy's horse upon the line of elephants, which then advanced and kept the Macedonians in check for some time. 'Wherever Porus saw cavalry advancing, he opposed elephants, but these slow and unwieldy animals could not keep pace with the rapid evolutions of the horse.'* At length the elephants, wounded and frightened, rushed madly about trampling down friends as well as foes. Then the small body of Indian horse being surrounded, was overpowered by the Macedonians, and nearly all slain; and the large mass of Indian infantry, which still held out, being vigorously attacked on all sides by the victorious horse, broke their ranks and fled. Then, says Arrian,† 'Kraterus, and the captains who were with him on the other side of the river, no sooner perceived the victory to incline to the Macedonians, than they passed over, and made a dreadful slaughter of the Indians in pursuit.'

30. "From the last statement which has been quoted, it is clear that the battle-field was within sight of Alexander's camp. Now, this is especially true of the plain about Mung, which is within easy ken of the east of Alexander's camp at Shah Kabir, the nearest point being only 2 miles distant.

31. "The position of Bukephala still remains to be discussed.

Bukephala.

According to Strabo, the city of Bukephala was built on the west bank of the river where Alexander had crossed it; but Plutarch says that it was near the Hydaspes, in the place where Bukephalus was buried. Arrian, however, states that it was built on the site of his camp, and was named Bukephala in memory of his horse. Diodorus, Curtius and Justin leave the exact position undecided; but they all agree that it was on the opposite bank of the river to Nicæa, which was certainly built on the field of battle. With these conflicting statements alone to guide

* Curtius, Vita Alex., viii. 14, 27.

† 'Anabasis,' v. 18.

us, it is difficult to arrive at any positive conclusion. According as we follow Strabo or Arrian, we must place *Bukephala* at Dilawar or at Jalalpur. Both places are equidistant from the battle-field of Mung, which was no doubt the site of Nicæa. If the two cities were built on the same plan, which is not improbable, then Dilawar would have the preferable claim to represent Bukephala, as its ruined mound is of the same size and height as that of Mung.

32. "The claims of Dilawar and Jalalpur are perhaps equally balanced, excepting in the one important point of position, in which the latter has a most decided advantage; and as this superiority would not have escaped the keen observation of the founder of Alexandria, Jalalpur must be the site of the famous city of Bukephala."

33. "Of the early history of the tableland between the Indus and Jhelum," again writes General Cunningham, in another work, "we have no distinct details. We know generally that it belonged first to the Mauryas of Pataliputra, next to the Greek successors of Alexander the Great, and afterwards to the Indo-Scythians. But in A. D. 631, when visited by the Chinese pilgrim Hwen-Thsang, it had already become tributary to Kashmir. This extension of the Kashmirian dominions was most probably due to Pravarasena, whose long reign certainly embraced the middle of the 6th century A. D. Before his time the country must have been subject to the Yuchi of Gandhara.

Early Kashmir influence.

34. "The ascendancy of the Kashmirian Kings would appear to have remained undisturbed during the whole period of the rule of the Karkota dynasty, or from A. D. 625 to 854. But during the reign of Avanti Varmma, A. D. 854 to 883, the Rajput Janjuahs of Gandhara must have annexed the whole of the outlying provinces between the Indus and the Jhelum, as his son Gopala Varmma, A. D. 883 to 901, is said to have conquered Alakhana, Raja of Gurjjara, who was protected by *Sriman Lalli Sahi*. Here we see that the *Sahi* or King of Gandhara had already extended his power eastward to the district of Gurjjara between the Jhelum and the Chenab.

35. "This *Lalli Sahi* is to be the founder of the dynasty, whom Al Biruni calls *Kallar*, and who was certainly reigning towards the end of the 9th century, and was therefore a contemporary of Sankara Varmma. On this occasion the Raja of Gurjjara surrendered the district of *Takka-desa* to the Kashmir King. But the troubles of a long disputed succession, which followed his premature death in A. D. 901, must have left the whole of the district between the Indus and the Jhelum at the mercy

of the powerful King of Gandhara, Samanta Deva, into whose hands they most probably fell without a struggle. From him they passed to his successors down to Trilochan Pal, who was finally dispossessed by Mahmud of Ghazni. The family would then appear to have sought refuge at Bhera on the Jhelum in the midst of their Janjuah kinsmen."

36. On the decay of the Hindu kingdoms and their fall before Muhammadan invaders, the Salt Range was incorporated in the empire of the successive dynasties of Afghans, Ghilzais and Moguls reigning at Delhi, but remained under the immediate sway of the Ghakkars (whose history will be found below). The Chiefs of this clan exercised power over the tract between the Jhelum and Indus rivers as feudatories of the Delhi Emperors, with the title of "Sultan." Their last representative, Sultan Muqarrab, was slain in battle with the Sikhs in 1770, and the Ghakkar Chiefship was absorbed in the growing kingdom of the Sikhs, which in turn gave way to British rule in 1849.

III.—ANTIQUITIES AND TRIBES INHABITING THE SALT RANGE AND EASTERN PART OF THE JHELUM DISTRICT.

37. A number of old Hindu temples exist in the Salt Range, which all belong to the Kashmirian style of architecture, with its fluted pillars and peculiar trefoil arches. These temples are found at Amb, Malot, Katas, and Baghanwala. They are all Brahmanical buildings, and from their style alone they must be assigned to the most flourishing period of the Kashmirian rule, or from about A. D. 650 to 900.

Temples.

38. According to General Cunningham, R. E., Director General of the Archæological Survey of India, Vol. V. of the Archæological Survey, "the Chinese pilgrim Hwen-Thsang describes *Seng-ho-pu-lo*, or Singhapura, the capital of the Salt Range, as being about 700 *li*, or 117 miles to the south-east of Taxila. It was 14 or 15 *li*, or 2½ miles in circuit, and was situated on a high mountain, which was both difficult and dangerous of access. All these conditions are fulfilled in the site of the ancient city of Malot. I believe, therefore, that Malot is the place indicated;* and as Hwen-Thsang eventually returned to China by Singhapura, it would seem that the most frequented road through this tableland must then have been by Kallar Kahar, and not by the Bakrala Pass. By this route Baber made all his invasions of India, and the road was so well known that Kallar Kahar received the name of *Darwaza Kahar*, or "Gate Kahar," because it was the gate leading to so many places. By Nili it led to Taxila and the Indus; by Chakowal to Manikyala and Jhelum; by Karuli to the salt mines and Bhera; and by Nurpur to Kushab and to the valleys of the Kurram and Gumal across the Indus.

Malot.

39. "The fort of Malot is situated on a precipitous outlying spur of the Salt Range, 9 miles to the west of Katas, and the same distance to the south-east of Kallar Kahar. The spur rises gently for some distance towards the south, and at its highest point ends abruptly in a precipitous cliff, overlooking the plains at a height of nearly 3,000 feet above the sea. The fort is of oblong shape, 2,000 feet from east to west and 1,500 feet from north to south, with a citadel on a higher level to the south, 1,200 feet long by 500 feet in width. The whole circuit is therefore about 8,000 feet. At present the plain is nearly deserted, there being only a few houses near the gate on the north. But it is full of ruined houses, and the spur to the north is also covered with the

* *See* Archæological Survey of India, Vol. II., p. 192, where this identification is suggested.

remains of buildings to a distance of 2,000 feet beyond the fort. In its most flourishing days, therefore, the town and fort of Malot must have had a circuit of not less than 12,000 feet, or upwards of 2½ miles, which agrees exactly with the 2½ miles circuit of Singhapura, as estimated by Hwen-Thsang. The fort also fully justifies his description of being difficult of access, as it has a precipitous cliff of from 100 to 300 feet in height on three sides, and is protected by a cliff from 40 to 50 feet high, with high stone walls and towers on its only approachable face to the north. It would be utterly defenceless against guns, which could sweep its entire area from the opposite hill on the west. But as the nearest point of this hill is 1,500 feet distant, with a deep ravine between, Malot must have been quite impregnable in the days of bows and arrows.

40. " The large tract of country which is bounded by the Jhelum and Indus on the east and west, and includes the Gandgarh Mountain in the north and the Salt Range in the south, is described by the astronomer Varaha Mihira as the north-western division of India under the general name of *Harahaura* or *Harahuna*. No trace of this name now remains, except perhaps in the *Haro* river, which flows past the old town of Haro, now called Hasan Abdal. Under the rule of the early Muhammadans this district was known simply as the " Mount Jud," from the resemblance of one of the hills of the Salt Range to Mount Jud, or Ararat, in Armenia.* Under Akbar and the Mogal Emperors it formed the northern half of the Sind Sagar Doab. The southern half of the Doab, or the plain country to the south of the Salt Range, is known by the general name of *Kachhi* or the "lowlands."

Legends of the Purans.

41. " According to the Purans, the whole of the Punjab was peopled by the descendants of Anu, who would have been called *Anavas* or Anuwan. In the lapse of time this would naturally have been shortened to Awan, which is the name of one of the most numerous tribes in the north-western Punjab. The western half of the highlands between the Indus and Jhelum is chiefly peopled by them, and is therefore commonly called *Awankari*. The eastern half of the highlands is divided into the two well-known districts of Potwar and Dhani; the former being chiefly occupied by *Ghakkars*, *Jats*, and *Gujars*, and the latter by *Janjuahs* and *Awans*, with a smaller number of *Jats* and *Gujars*.

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* Baber's Memoirs by Leyden and Erskine, p. 254.

42. "The distribution of races was much the same in the time of Baber, but with the marked absence of the Awans as a promiment tribe.

Account by the Emperor Baber.

His words are:—'In the hill country between Nilab and Bhera, but apart from the tribes of *Jud* and *Janjuah*, and adjoining the hill country of Kashmir, are the *Jats*, *Gujars*, and many other men of similar tribes, who build villages and settle on every hillock and in every valley. Their Hakim was of the *Ghakkar* race, and their government resembles that of the *Juds* and *Janjuahs*.' Here there is no mention of the Awans, and even supposing that they may be included amongst 'the other men of similar tribes,' yet this refers only to the northern half of the province adjoining the hill country of Kashmir and not to the large district of Jhand or Awankari."

43. At present the principal tribes inhabiting the Salt Range and the eastern part of the Jhelum district are: Ghakkars, Janjuahs, Jats, Awans, Syads, Gujars; and among Hindus: Brahmans, Khattris and Aroras.

The Ghakkars.

44. "The Ghakkars," wrote Colonel Cracroft, Settlement Officer of the neighbouring district of Rawalpindi, "are undoubtedly the tribe to which most historical interest attaches. They are mentioned as having resisted the irruptions of successive hordes of invaders with varied success. The account they give of themselves is as follows:—They say they are descended from Khair-Gauhar, Khyanee, of the reigning family of Ispahan. They claim to have conquered Thibet and Kashmir, and to have held the latter province for a long time, until one of their ancestors, Sultan Cabul, was driven out of it after the murder of his father Sultan Rustam. Sultan Cabul fled to Kabul. His son, Ghakkar Shah, became a favorite of Sultan Mahmud Ghaznuvee, and accompanied him in some of his invasions of the Punjab. In A. D. 995, Mahmud gave Ghakkar Shah the country between the Indus and the Jhelum. The Ghakkars continued to rule this tract with varied fortune, paying a small tribute to the Mogal dynasty reigning at Delhi, until A. D. 1770, when the Sikhs conquered the country. They were easily subdued by the latter, after the defeat of their renowned Sultan Muqarrab, who fell in the battle of Gujrat."*

45. But, according to another account, "just sixty years earlier, in A.D. 1008, the Ghakkars are represented by Ferishta as joining

* Vol. II. of the Archæological Survey of 1862-65.

the great array of Hindu Chiefs against Mahmud of Ghazni. A desperate battle was fought near Peshawar, when 'no less than thirty thousand Ghakkars, with bare heads and feet, and variously armed, penetrated into the Muhammadan lines, where a dreadful carnage ensued, and 5,000 Muhammadans in a few minutes were slain.'* 'Such,' says Price, 'was the impression of this desperate effort that Mahmud was actually about to draw aside from his encampment, and to discontinue the conflict until the day following,' when an accident gave him the victory.

46. "At a still earlier date, in A.H. 63, or A.D. 682-83, the Ghakkars, according to Ferishta, formed a treaty of alliance with the Afghans, and with their assistance compelled the Raja of Lahore to submit to their terms, and to cede to them a portion of territory.† Just 50 years prior to this time the Chinese pilgrim, Hwen-Thsang, had twice passed through Taxila, but on both occasions he avoided the country now occupied by the Ghakkars. As nearly two centuries and a half earlier, or, in A. D. 400, another Chinese traveller, Fa-Hian, had also avoided their country, the Ghakkars of those early days had evidently earned an evil reputation.

47. "They are a proud race," continues Colonel Cracroft, "refuse to give their daughters in marriage to any other class than the Syads: their 'purda' is more strict, they only marry girls of the Sutti, Gharwal, Dhund and other 'Sahu' classes, and then only when they cannot make a suitable match among themselves. The term 'Sahu' is tantamount to our expression, 'gentle' as applied to descent. In general, if they marry a woman of lower caste, the issue does not succeed to property. In some instances, however, they give smaller shares to such progeny. Widows are not allowed to re-marry. They live unmarried apart, or with a near member of the husband's family.

48. "Some of their principal men are very gentlemanly in their bearing, and shew unmistakeably their high origin and breeding.

49. "As agriculturists, they must be considered among the classes similar to the Syads and others, who cannot carry agriculture to a high pitch of perfection. They are averse to labor with their own hands. They

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* Brigs' Ferishta, I, 46, 47.

† Brigs' Ferishta, I, 8.

still cling to their traditions, and are looked up to in the district as men of high rank and position. In times of commotion, they would assuredly take the lead one way or the other. The Sikhs reduced them to the most abject poverty, with one or two exceptions, such as the Sang and Munyanda Ghakkars."

Janjuahs.

50. The following account of the Janjuahs is extracted from Sir Lepel Griffin's Punjab Chiefs (pp. 602—6) :—

"It is difficult to say, with any approach to certainty, how long the Janjuahs have been resident in the Punjab, but they are probably the descendants of Yadu Rajputs, the companions of Ujamida. That this tribe has been identified with the Johiyas and Jodhis of Rajputana history only increases the difficulties regarding it. It is true that the Salt Range, to the north of the river Jhelum, is recognized as the original settlement of Yadu Rajputs, and to this day retains its ancient name of the 'Hills of Jodh.' But the Johiyas of Bikanir, who, though now extinct, were numerous 300 years ago about Bhuropal, seem to have had little in common with the Janjuahs of the Jhelum. As early as 740 A. D., Johiyas and Jodhis are mentioned with Kokhars, Dodis and Syads, as allies of Hussain Shah, Chief of the Langa Pathsan, in his war with the Bhatti Rajputs. But the traditions of the Janjuahs themselves do not point to a very ancient occupancy of the Punjab. They all trace their descent from a Raja Mal, a descendant of the Pandus and of the Rahtor Rajput race, who, about the year 980 A. D., emigrated to the Punjab from Jodhpur or Kanouj, which latter country was then ruled by a Rahtor Prince. Hearing that the Pandus had once taken shelter in the hills to the north of the Jhelum, he journeyed there with his followers and founded the village of Rajghar, now famous under the name of Malot. There he ruled in peace till the invasion of India by Mahmud of Ghazni. When that monarch summoned him to his presence, Raja Mal refused to attend, so Mahmud sent a force against him, which defeated and took him prisoner; and to save his life and regain his liberty he was compelled to renounce his Hindu faith and adopt Islamism. The name of the tribe is said to have arisen from this conversion when the 'Janju' or thread worn by Raja Mal and all Hindus, and denoting his caste, was broken. The Janjuahs are unanimous in thus placing the advent of their great ancestor into the Punjab in the tenth century, which is the more remarkable as it is

Tradition of origin of Janjuahs.

certainly erroneous. Their genealogies also confirm their story. The longest are those of the families of Natel, which gives 23 generations from Raja Mal, of Choya Saidan Shah and Baghanwala, which allow 22 and 21 respectively. There are families, as the Malot and Dilwal, whose genealogical trees take only 17 and 18 generations to arrive at the same ancestor. Allowing 30 years for a generation, which is too liberal an average, the longest of these genealogies does not extend over more than 700 years. Raja Mal is said to have built a temple and tank at Malot, and also at Katas, which is a sacred place of pilgrimage, and is visited every year by many thousand Hindus. He left 5 sons, Wir, Jodh, Kehla, Tarloni and Khakka. But Jodh and Wir are the only sons of Raja Mal who require any special notice. On the death of their father, they determined to divide the country called from Raja Mal, the Muloki Dhan (the Dhanny country) between them. Jodh took the Salt Mines about Makrach, and captured the town of Makshala from a colony of Brahmans who had settled there. He changed its name to Makhiala, and built there a fort and two tanks for rain water, on which the inhabitants still entirely depend, as there is no spring of drinking water near the town. Wir Khan took possession of Khewra near Pind Dadan Khan. He had 1 son, Raja Ahmad Khan, from whom have descended the families of Malot, Badshahpur and Dilwal. Jodh was the father of 4 sons, Rahpal, Sanspal, Jaspal and Jaipal. Rahpal, the eldest son of Jodh, ruled at Malot, and his son, Naru, built Naru on the Boonna Nala, while his grandsons, Hast Khan and Tatar Khan, founded Girjak, which became a large and flourishing town, though now ruined and desolate. The Janjuahs soon became split up into many clans, divided among themselves, and thus unable successively to oppose tribes in no way superior to them in courage or military skill. They joined Timur Shah when he invaded India in 1398, and fought under him throughout his campaign. In 1526, they readily submitted to Babar Shah, who has given a somewhat detailed account of the tribe in his memoirs. He mentions that its two divisions were then known by the names of Jodh and Janjuah, agreeing with the Jodhis and Johiyas of Rajputana history, though at the present day both have the common name of Janjuah. The Ghakkars were the great enemies of the tribe, and drove them out of many of their villages. The Awans also pressed them hard, and the Sikhs, last and worst of all, completed their overthrow. There is now no man of wealth or importance belonging to this ancient tribe."

Janjuah families.

51. "The Jats," adds the compiler of the *Gazetteer*, "here as elsewhere, are all agriculturists, and fully sustain their reputation for skill and industry. Of the total number found in the district only 18 are returned as Hindus. They hold the whole central portion of the district, north and south of the main Salt Range, the hills themselves being held by the Janjuahs. Their lands lie between those of the Awans to the west and of the Ghakkars to the east. The principal sub-divisions of the tribe are the Mairs, Kasurs, Kahuts and Phapras. Originally the Jats appear to have cultivated as tenants of Ghakkar and Janjuah Chiefs. But the Emperor Bahadur Shah, at the beginning of the 18th century, ejected these Chiefs from the Dhanni country and made it over to certain 'chaudhris' of the Mairs and Kasurs, appointing them 'talukdars' or middlemen, to collect the revenue and bring it into the Lahore Treasury. The 'chaudhris' from that day became persons of considerable power, and gradually usurped the whole proprietary right of the country entrusted to them. They founded new villages, extended cultivation, sank wells, and generally devoted themselves to the improvement of the agricultural resources of the country. Before long, however, the curse of the division fell upon them, and during the dissolution of the empire the contending parties called in the aid of the Sikhs. They were soon ousted from their estates by their new allies, and though they managed to recover a part, they forfeited all in 1848 as the penalty for joining the Sikhs against the English. They still retained, however, considerable influence in the district, and in the year of the mutiny they distinguished themselves by some services and by general good conduct. In reward for this, the proprietary right in some of their old estates was restored at the time of Settlement, and small allowances from the revenue were granted to a few heads of families. The title of 'chaudhri' is still extant."

Jats.

52. "The origin of the Awan tribe," wrote Sir Lepel Griffin in his work above quoted, "has been the subject of much speculation. At one time the Awans have been considered of Hindu, at another of Afghan descent, and by some as the descendants of the so-called Bactrian Greeks. But there is nothing in the traditions of the Awans themselves to favor the last supposition, and indeed it is very doubtful whether any Greeks settled in Bactria at all. The probability is that every Greek in Alexander's army turned his back with joy upon

Distribution of Awans in the Punjab.

India and the East, while the detachment of the army which remained behind in Bactria was composed of barbarian auxiliaries, from whom no historian or philologist would care to derive any tribe whatever. The Awans are widely scattered throughout the Punjab. Thickest in Rawalpindi and Jhelum; they are numerous in Shahpur and Leia, and even stretch across the Indus into the Derajat, and some 3,000 inhabit the Yusafzai plain. There are many Awan villages in Gujrat and Sialkot, and a few in Amritsar and Jullundur. But all branches of the tribe are unanimous in stating that they originally came from the neighbourhood of Ghazni to India, and all trace their genealogy to Hasrat Ali, the son-in-law of the prophet. Kutb Shah, who came from Ghazni with Sultan Mahmud, was the common ancestor of the Awans, the Khokars and the Khattars. The Awans seem first to have settled in Rawalpindi, where Shamir Khan built a town on the Indus, which he called Shamirabad, after his own name. They gradually spread over the country, fighting with the Gujars and their kinsmen the Khattars, driving before them the Janjuahs, and being in turn driven out of their holdings by the Ghakkars, the most powerful tribe of all. It is not practicable to follow the history of the several branches of the Awan tribe. It was only in the Rawalpindi, Jhelum and Shahpur districts that they became of any political importance. In other parts of the Punjab they appear as quiet peasants, not such good agriculturists as the Jats, but still industrious and intelligent."

Gujars.

53. "The Gujar of Jhelum," according to the *Gazetteer* of the district, "differs widely from his congeners elsewhere. In the south the Gujars have not the best of reputations. They are chiefly pastoral in their tastes and have a propensity for thieving. Here, on the other hand, they are reckoned among the best cultivators of the district, and are a fine, manly race, with merry, open faces. Many of their numbers, notably the 'chaudhris' of Kala, have risen to a position in the district of no little influence and importance. These 'chaudhris' owed their rise to the Emperor Bahadur Shah, who put them in a position of authority over the 84 Gujar villages near Jhelum, of which theirs was the largest. This position was maintained by the family till the time of the Sikhs. After their conquests, however, the 'chaudhris' rapidly declined. The family 'jagirs' were gradually cut down by the conquerors, and the present representative possesses but a few acres in his ancestral village. Kala is situated a few miles due north of Jhelum,

and the tract held by the Gujars extends from this point towards the north and west, surrounded on every side by land held by the Ghakkars. The Gujars are exclusively Muhammadan, only 13 in the whole district being returned as Hindus.

Syads.

54. "The Syads are scattered as landowners through the district, having in most instances received their estates as religious gifts from the more warlike tribes who have successively occupied the district. Thus in Awankari, as that portion of the district is called, which is held by the Awans, in many villages the Syads hold half, having been located by the Awans, when they seized the country.

Brahmans.

55. "The greater proportion of the Brahmans of the district follow the ordinary avocations of the caste. They are of several tribes, which are said, subject to certain restrictions with regard to employment, to eat together and intermarry. One branch of the Brahman caste requires special notice, that of the Bhuinhals. These are by origin said to be true Brahmans, but to have adopted many customs peculiar to Rajputs. Whether or no they are truly Brahmans or Rajputs Brahmanized, it is impossible to say. They are otherwise known by the names of Mahtar (great) Brahm-Rajput and Satbansi (of 7 tribes), and, in this district at any rate, are looked up to with peculiar respect. They are divided into 7 tribes, named respectively Dat, Vaid, Bali, Chibbar, Mohan, Bhimwal and Lau. These eat together and intermarry without scruple, but they look down upon other Brahmans, and will not eat or intermarry with them. Occasionally a Bhuinhal will take to wife the daughter of an ordinary Brahman, but the offspring is looked down upon; while if a Bhuinhal gives his daughter in marriage out of the 7 tribes, he is punished by exclusion from his caste. They are said especially to reprobate 3 things, the taking of charity, the handling of scales (trading), and living a life of laziness. They principally employ themselves as agriculturists, or by taking service in the army, or as 'chaprassis.'

Aroras.

56. "These are Hindus and exclusively employed in mercantile pursuits. They require no special notice."

IV.—GEOLOGICAL.*

57. "Of itself, the Salt Range forms a prominent physical feature of North-Western British India, rising between the flat plains and *thal*, or desert, of the Lower Indus basin and the elevated Potwar† plateau embayed between the outworks of the Himalaya, Hindu Kush and Afghan mountains. It rises above the adjacent tracts, but with a considerable relative difference of altitude on either side, as do the Western Ghats above the Deccan and low coast plains, or as the Himalaya Range itself rises above the high plains of Asia on one side, but stands at a much greater difference of level above the low plains of India on the other. One analogy with the latter range as to some physical peculiarities might even be carried further, the general watershed of the adjacent countries in both cases lying northward of the principal elevations, and both being bordered to the south by a fringe of coarse deposits brought down by swollen torrents from the hills.

SALT RANGE.

A prominent feature of N.-W. India.

58. "Here, however, the physical analogy ceases; the aspect, stratigraphical structure and forms of the two regions being even more dissimilar than are their respective heights. Formations of the same geological age have, it is true, been found in both, and some few fossils from each have been pronounced identical, but the petrographical characters of the rocks are totally different.

59. "The essential feature of the Salt Range is that it forms a bold escarpment to the southwards, this character being obscured in some places by reason of the contorted state of the rocks, and in others very prominent, presenting a fine façade of lofty cliffs, bluffs, and precipices overlooking numbers of steep valleys and penetrated by profound ravines or gorges,‡ some of which almost deserve the name of cañons.

Its features.

60. "These features contrast strongly with the flatness of the plains below and with the undulating or hilly plateaux, which for 76 miles crown the acclivities, or with the more gentle northerly slopes intersected, as they descend to the Potwar, by an intricate labyrinth of deep, narrow, often vertical-sided ravines, such as are rarely seen save in this region,

* The account of the geology of the Salt Range is taken from the Memoirs of the Geological Survey of India, Vol. XIV.

† This plateau has several divisions with different names, but that of one of them, the Potwar, is often applied to the whole of the ground lying immediately north of the Salt Range.

‡ This word "gorge" is frequently locally used in speaking of the deep throat-like "gulches" of the range, to which it appears very applicable.

and which have won for it the special name of *Kuddera*,* from inhabitants generally unobservant of natural features, and often ignorant even of the names of those beyond their own immediate locality.

Southern escarpment.

61. "The southern escarpment is strongly marked along most of the range, rising to an average height of 2,200 feet above the plains at its foot, which are seldom more than 750 feet above the sea. Lofty portions of it also look down upon the Potwar plateau, the edge of which (with heights averaging 1,824 feet) does not reach to within 1,074 feet of the mean height of the Salt Range.

The Potwar.

62. "A very gradual increase of these heights takes place westwards towards the most elevated summit, Sukesar, which is situated 36 miles from the western extremity of the range at the Indus. Here the general elevation is 4,500 feet, and the summit itself has an altitude of 5,010 feet.

Variety of form of range.

63. "But the Salt Range is not entirely a simple elevated tract strongly scarped on one side and surmounted by undulating open plateaux. This is its character in the central region, except that the northern sides of its plateaux are commanded by a minor escarpment facing to the south. At each end of this upland country the features change considerably ; in the east one or two conspicuous hills rise above neighbouring portions of the range, while to the west the ridges enclosing a flat depression, called the Son, converge, and unite with the superior mass of the peak Sukesar.

From Jalalpur to eastward.

64. "Eastward of Jalalpur the extension of the principal ridge becomes distorted and sinuous, and is cut through by the channels of two considerable rivers, the Boonna and the Kahan ; Mount Tilla, one of the most lofty eastern elevations, occurring at the part interposed between these streams. This Mount Tilla ridge is generally between 3 and 4 miles broad ; it averages nearly 2,000 feet in height, and culminates at Jogi-ka-Tilla in an elevation of 3,242 feet. Just to the westward of this, where the mountain is highest, its width is barely above a mile. The Chambal portion of the Tilla chain, nearest to Jalalpur, rises to 2,290 feet, has a north

Mount Tilla.

* A narrow valley in this part of the country is called a "darra" kas or "khad"; the affix is taken to mean a multiplicity of forms. A large glen or stream course (dry or otherwise) is called a "wan" or "van"; as Nila Wan, the Blue Valley, named after the colour of its stream as seen from above.

and south direction, bending towards the west, where separated from Mount Tilla by the Boonna gorge, and, declining by successive ridges eastward, dies out in the alluvial flat of the Jhelum near the Grand Trunk Road eastward of Rotas.

Bakrala Ridge.

65. "From the northern side of the range at a point N. 10 E. from Pind Dadan Khan, an important spur, separated by a deep gap from the main mass, leaves the latter and stretches for more than 30 miles in a north-easterly direction. Close to the range, where it forms the Diljaba Mountain, this spur has a height of 3,052 feet, but further on it declines to heights averaging 2,336 feet, and it has been called the Bakrala Ridge from the pass of that name on the Trunk Road. Its highest point in this neighbourhood is Nili Hill near Domeli, and the ridge having a general width of 2 or 3 miles may be said to end in the broken hilly ground extending for some distance from the right bank of the Jhelum in the vicinity of Lahri.

Changes in the escarpment.

66. "From Jalalpur for 16 miles to the W.-N.-W. the escarpment of the main range is very plainly marked, rising gradually in height from 1,852 feet to 2,275 feet (the level of the neighbouring part of the Jhelum river is about 700 feet), and the width of this part of the range steadily increasing westwards from 2½ to 6 miles.

Salt lakes.

67. "The four salt lakes of the range form quite exceptional features to the general drainage. Three of them are on the western or Son plateau; two of these, the Khabaki and Son Sukesar, or Samandar, lakes, in depressions of its northern part; and the other, the Jalar or Jalur lake, in the rugged country to the south. These three lakes vary in size with the amount of rainfall; they have no outlets, and are all salt or saline, though far removed from and at a higher elevation than the salt-bearing strata. The largest of them is the Samandar lake, about 3 miles long and 1 wide. The fourth, the lake of Kallar Kahar, having a diameter of about a mile and only a depth of 3 or 4 feet, is situated close under the north side of the range. It has no outlet either except when flooded; a neighbouring nala then affords a passage for the surplus water, and sometimes its white saline bed is all but dry.

68. "There may be various reasons for the saltness of these lakes, which differs in intensity, and would seem not to be derived from chloride of sodium only; ordinary precipitation from water, unable to

escape except by evaporation, may have caused it. In the case of Kallar Kahar, brine springs at one place have an influence; and with regard to the Son, the saltness may be due to the former existence of overlying sandstones and clays charged with saline ingredients.

Aspect.

69. "Viewed from the north, the aspect of the Salt Range is that of a monotonously undulating and not very lofty ridge, upon which some conspicuous summits, such as those of Chel, Karangli, Tilla, and Sukesar, attract the eye. Closely approached over '*Kuddera*' ground, the range may be often observed covered with scrubby jungle and on limestone slopes by a mass of *Sanatta** and *Behkiar*† shrubs, through which it is difficult to work a passage. Having once left the plateau, almost everywhere on the ascent the bare rock protrudes, presenting a striking uniformity of grey and greenish or red tints, the latter sometimes predominating and sometimes replaced by a dusky orange; all these brighter colors being restricted to argillaceous rocks. On the undulating plateaux small patches of cultivation lie between rocky undulations dotted or covered with *Sanatta* jungle, trees of any size being almost entirely absent everywhere along the range.

70. "Seen from the south, the scarcity of vegetation and the bright coloring of the red, purple, grey, orange, and whitish rocks of the cliffs and slopes present a strong contrast to the other aspects of the range; the fan-shaped accumulations of detritus at the mouths of the torrent gorges encroaching upon each other to form a stony belt, slightly concealed by thin, starved-looking jungle, which only adds to the sterile appearance of the ground. The whole of this dry and sun-burnt face of the range radiates so much absorbed heat, that an encampment at some distance in the plains, though hot, is found to be cooler than one at its foot.

71. "Picturesque spots occur occasionally, their attractiveness enhanced by their rarity; and there is much that is imposing, though wild, in other scenes. Instances of one or the other may be found in the summit of Mount Tilla, with its ruins and ancient buildings; the rock-pools and gardens of Choya-Saidan-Shah; the antiquities of Katas and Rotas; the lofty village of Dandot; the neighbourhood of Kallar Kahar, when the vines are in leaf and the lake is full; the grand glens of Nilawan, Sardi, and Narsingpur; the vicinity of Sodhi near the head of the

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* *Dodonæa burmanniana.*

† *Adhatoda vasica.*

latter ravine; the deep glen of Amb; and the gorge of the Indus at Kalabagh, with salt-rock, water, boats, and quaintly piled buildings, making up a brightly-colored picture, in which the crimson *rol* from burnt alum shale, and duller red salt-marl, contrast with the cool greenish-greys of the lofty Dangot cliffs in the back ground.

72. "The Salt Range and the neighbouring parts of the Himalaya are as unlike in geological structure as adjacent regions containing several of the same formations need well be. The Khasia Hills,* 11 to 1200 miles distant, occupy a somewhat analogous position with regard to the great chain; yet, notwithstanding the distance, the geological section of that distant locality is not more dissimilar than that of the nearer known Himalayan regions described by Mr. Medlicott,† Dr. Stoliczka,‡ and others.§ From the Salt Range to the Khasia Hills, the structure of the ground concealed by the Gangetic or other alluvium is quite unknown, and in other directions, towards the peninsula of India, so far as the country has undergone examination, its geology is equally different from that of the Salt Range, so that the latter becomes unique if its geological features do not extend westward and south-westward.

Disparity with Himalayan regions.

73. "The disparity with the Himalaya consists not so much in the absence of formations common to both as in the relative character of those represented; the deposits of each possess petrographic and palæontological characters peculiarly their own, analogous to the distinctions marking the 'Alpine' and 'extra Alpine' regions of continental palæontologists.

74. "*Rock Groups.*—They are naturally divisible into groups thus:—

No. 1.—The lowest is the gypseous red salt marl with rock-salt.

No. 2.—The group which succeeds is less constant than the last but its massive purple sandstones are prominently seen in the southern sections.

No. 3.—Overlying No. 2 is a zone of softer nature and darker color, black to dark gray argillaceous beds, with harder bands. It divides and dies out to the westward, and it contains the oldest fossils met with Silurian.

* Mem. Geol. Survey, India, Vol. I.
† *Ibid*, Vol. III.
‡ *Ibid*, Vol. V.
§ *Ibid*, Vol. IX.

No. 4.—The last group is closely succeeded by a strong and frequently much harder zone, characterised to the east by hard magnesian and other light-colored sandstones with beds of dolomite. It also dies out westward. The continuation of the succession above this group differs in different parts of the range.

No. 5.—Near where No. 4 becomes divided and no longer traceable as a connected group, its beds are succeeded by a softer and coarser set of granular, strongly bedded, sandstones, surmounted by pale lavender-colored clay.

No. 6.—Resting immediately on the last is a group of limestones chiefly crowded with carboniferous fossils, and only developed at the western side of the range.

No. 7.—So intimatelyunited with the preceding as to appear to form a conformable upper portion is another group of limestones, sandstones and shales or clays in which fossils are numerous. It is not quite so extensive laterally as No. 6, and between these lies the boundary separating the palæozoic and mesozoic rocks, this upper group being of Triassic age.—(Waagen.)

No. 8.—To carry on the succession we must again turn to the eastern part of the range which groups 6 and 7 do not reach. Here, resting upon No. 4 and disappearing near the commencement of No. 5, is a group of thin, flaggy sandstones interstratified with blood-red clays, which, from its general relations to the rocks above, has been considered to occupy nearly the same place as the distant westerly group No. 7, both being probably Triassic, though this can only be decidedly stated for the former.

No. 9.—The next group lies in the far west of the range succeeding No. 7. It contains white, red, and soft sandstones, with yellowish and grey limestones, and yellow marls. Its fossils are numerous and of Jurassic age.

No. 10.—Newer than the last, but never in contact with it, is a zone of soft, greenish brown, and olive sandstones, conglomerates, and dark shales. It commences in the eastern part of the range, extending further west than No. 8 or any of the underlying groups to the east; fossils are most

rare and ill-preserved, but such as were found were considered by Dr. Waagen probably cretaceous.

No. 11 group is the massive white or light-colored nummulitic limestone forming so marked a series of cliffs and escarpments, and of which the summit of the range consists. It disappears in the dislocations at the Indus and also thins out to the east.

Nos. 12, 13, and 14 include the portions of the tertiary sandstone and clay series overlying the nummulitic limestone. Three sub-divisions of it, including Nahan and Siwalik beds, have been recognised, chiefly in the east part of the district, by Mr. Medlicott.

No. 15.—In this may be included the alluvial and other superficial deposits, together with an older diluvial or post-tertiary conglomeratic group.

V.—FORESTS AND RESERVES IN THE SALT RANGE.

Demarcation of forests.

75. The surface of the hills is covered in many parts with low-stunted forest and brushwood, consisting chiefly of *karil* (Capparis aphylla), *pilu* or *jal* (Salvadoro persica), *ber* (Zizyphus jujuba), *phulahi* (Acacia modesta), *jand* (Prosopis spicigera), and *sanatta* (Dodonœa burmanniana). A large area of the hillside has been for a long time waste land under the control of Government, divided into reserves called '*rakhs*,' which have recently been re-demarcated, in order to remove any hardship caused to the inhabitants of villages adjoining the rakhs, by the first demarcation of boundaries in 1865-66. The investigation has resulted in placing about 315 square miles of the Salt Range under the Forest Act as reserves, and about 152 square miles under the direct management of the Deputy Commissioner of the Jhelum district as Government rakhs. The rights of the villagers have in every case been inquired into and considered, and all unnecessary restrictions imposed under the old demarcation rules have been removed.

VI.—COAL.

Localities of coal-beds.

76. Besides salt, the Jhelum hills contain coal, but of poor quality, full of iron pyrites and much mixed with layers of shale; when exposed to the air it disintegrates and falls into pieces. The largest beds are in the neighbourhood of Khewra, near Pind Dadan Khan, and at Bhaganwala, situated 10 miles west of Khewra; but even this coal is capable of doing the work of only 2½ to 4 maunds of wood; and as all coal which is easily accessible has already been removed, the greater expense of working makes it difficult to bring it into the market at a profitable rate.

Extent.

77. Coal deposits are also found across the Indus in the Kohat district, and the Kalabagh coal (on the right bank of the Indus) is perhaps the best in quality of all the Salt Range coal. The seams appear to extend about 150 miles from east to west. The following account is given in the Manual of the Geology of India of the probable explanation of the difference between the Assam and Punjab coal-fields :—

Explanation of poor quality of the mineral.

78. "It is possible that in tertiary times the meteorological conditions which determined the amount of moisture in the air may have been of a character directly comparable to those of the present day, though, as the relative positions of land and sea were different, they cannot have been identical. In Assam there is now an abundant rainfall and luxuriant vegetation, and these conditions must have existed when the materials of the large coal-seams were formed. In the Punjab there is but little rainfall and a sparse vegetation. Such a type of vegetation as, if it or anything like it existed in tertiary times, before its quantity could have been diminished by human influence, would have been sufficient to supply materials for the formation of the limited nests of lignite and thin seams of coal, which are all that have as yet been proved to exist in the Punjab rocks. Some of these indeed may owe their origin to mere accumulations of sea-weed. Nothing, however, which is said here is intended to imply that continuously workable seams of coal cannot occur in the Punjab or in any of the adjoining countries to the west and south, but the evidence all points to the conclusion that such seams have no existence. In many places there are complete sections of

the upturned edges of the rocks unobscured by vegetation where, if coal occurred, it must be visible."

Recent experiments with coal.

79. The management of the coal workings was formerly under the control of the Forest Department, the chief deposits being situated within the area of reserved forests; but in accordance with the orders of the Government of India passed in December 1881, it has been transferred to the Customs Department. The Customs Officers will no doubt be better able to supervise the operations of the excavators, who will naturally consist largely of the salt miners, and to prevent the illicit excavation of salt, which everywhere lies immediately under the coal-seams. In the Administration Report however of the Northern India salt revenue for the past financial year, it is stated that though 4,000 maunds of coal were excavated and delivered at the Miani Railway station, it was found to contain so much shale and slack that it was inevitably rejected, and since then the miners have suspended further work.

Petroleum.

80. Petroleum is also found at two spots in the Salt Range, but the quantity of oil is insignificant, and the yield of the Jhelum Hills in this respect cannot be compared with that of the ranges further north in the Rawalpindi district.

VII.—SALT.

81. The geological formation of the Salt Range as a whole has been described above. The following description of the geology of the Mayo or Khewra mines, from which six-sevenths of the salt is extracted, is taken from Dr. Warth's Report printed as an appendix to the Salt Administration Report of 1869-70.

Geological formation of the actual salt mines.

82. It should be noted here, before entering an account of the salt excavations, that in April 1870 His Excellency Lord Mayo visited the Sajiwal and Baggi mines at Khewra, and since then these have been designated as the Mayo Mines to mark the honor conferred on the locality by the first visit ever paid to it by any Governor-General or Viceroy. The rock salt of the Salt Range is the oldest known deposit of salt in the world. Its underlying beds containing Siluvian fossils, it belongs to a period not younger than Siluvian. The Kohat salt, on the other hand, is not older than the Eocene age.

83. "One conformable series of strata occur in the neighbourhood of Khewra, which we call the sandstone and salt formation of the Salt Range.

Geological description of Mayo Salt Mines and environs.

84. "The sandstone and salt formations are divided into altogether 7 different strata.

Division of strata.

85. "The following are all the strata from above downwards :—

Strata.		*Thickness.*	*Average.*
Recent form—Debris of Gypsum, &c.	...	100′ – 200′	150′
Limestone form—Nummulitic limestone	...	...	200′
Coal formation—Coal, Alumshale and Marl	...	...	20
Sandstone formation—Green Sandstone	...	...	600′
Blue Marls	...	100′—150′	125′
Red Sandstone	...	400′—800′	600′
Salt formation—Upper layer of white Gypsum,		5′	5′
Brick-red Marl, or Gypsum...		60′—200′	130′
Brown Gypsum	...	80′—200′	140′
Lower layer of white Gypsum		200′	200′
Salt marl and salt	...	600′	600

Volcanic—Trap piercing through the lower strata up to the boundary between the upper layer of white Gypsum and red Sandstone.

The total thickness of the—

Sandstone formation is	1,325 feet.
Salt formation	1,075 „
Total sandstone and salt formations	2,400 feet.

86. "The most characteristic strata of this formation are the green sandstone and the brick-red gypsum. The former constitutes the crown of all the heights. The brick-red gypsum crops out on the base of the hills, and in the gorges, and is the indicator of the salt formation all over the Salt Range. There are enormous quantities of brick-red gypsum at Khewra, not only low down in the gorges, but high up towards the summit of the hills, indicating the enormous riches of salt within them.

Salt formation.

87. "The salt formation begins with the brick-red gypsum, if we omit the small layer of white gypsum which mostly, but not invariably, occurs between the brick-red gypsum and the red sandstone. The brick-red gypsum crops out on the south side, on the slope of the hills towards the plains, and again far up in the Khewra gorge below the sandstone formation. It surrounds the great raised centre of the salt formation, and for the most part covers it. The red gypsum is a most peculiar brick-red colored mixture of clay and crystallized gypsum. One might as well call it brick-red marl, but I prefer the former expression, because the gypsum is the principal constituent of the mixture. Below the brick-red gypsum, the brown gypsum appears. This mixture is similar in composition to brick-red gypsum; there is only a difference in the color, that is, it is brown instead of brick colored. Large masses of this so-called brown gypsum appear in the Khewra or Mittha-patan gorge, between Kalre Kas and Bhandar Kas on the left side, and opposite these again on the right side of the gorge at the foot of Tricki Hill. Much brown marl appears up along the Bhandar gorge, and still more all up Keari gorge. Below the brown gypsum lies a thick layer of white gypsum. These lower strata are much developed in the Bhandar Malkana, and lower end of the Biliwala gorges. There are also complete hills of it, one south of the Deputy Collector's bungalow, opposite to Linda and Gitealli, and another further to the south, the 'Lari Lara Ke Kabar,' a name derived from the plunder and murder of a marriage procession. There is a nearly continuous formation of this stratum extending from Biliwala gorge to Malkana gorge, all along the slope of the hills west and south of Drangar, which includes layers of limestone perforated with small holes. This latter, which is only a few feet thick, but very pure, occurs in the Bhandar gorge, in Malkana gorge, and even in the lower part of Biliwala gorge, &c. The Giteali Hill takes its name from the large quantity of small pieces of this limestone lying about on its summit.

Salt marl.

88. " The next deposit below the gypsum is the salt marl, which includes the strata of pure workable salt. It appears on the surface at the following places :—On the Mayo Salt Mines Hill, on the south-west side extending from above Baggi mine to below Pharwala mine, on the south-east side of the Mayo Salt Mines Hill, between Sajiwal mine and the old Chingwala mine, and beyond Chingwala. The salt seam also crops out in the fresh water drain above Sajiwal, and in the deep cutting of the road from the Mandi to Sajiwal, east of Biliwala mine. The next considerable outcropping is at the foot of Mount Linda. Opposite this place on the left side of the gorge along the foot of the gypsum hill, near the Deputy Collector's bungalow, the salt shows itself at various points, proving its uninterrupted connection. The salt in former times must have extended over the gorge, and its removal by water may have very much contributed to the formation of the Khewra gorge. There is also salt up at Niari, for on the left side of the road going up the hill very near No. 31 Chauki, a single block of salt is to be seen amongst the debris, 20 feet above the base of the Khewra gorge, at the mouth of Ghamma Kas. Crossing over these hills to the west, we find at their foot, in the Daliri gorge, 2 groups of old salt mines, and still further to the west we see salt cropping out in the gorge itself. An entirely detached piece of salt similar to that in Ghamma Kas is also visible on the road from the Mandi to Sajiwal to the right near the Sajiwal Chauki. This piece of salt lies in the debris of gypsum and salt marl. These are all the places where salt crops out, except in one instance, which is most interesting. In Kabra Kas, contrary to all rules, the salt crops out for a length of 40 feet between the brick-red gypsum and the red sandstone.

Present mode of working the salt mines.

89. "Embedded in the salt marls of the hill at Khewra are the various thick seams of pure salt, which form the resources of the Mayo Salt Mines.

Mines now worked.

90. " Those now worked are called the Baggi and Sajiwal mines. The next largest excavations are the Pharwala and Makhad mines, neither of which are worked now, but are open, and have been surveyed. There was another large mine, Chingwala, east of Sajiwal, but its entrances have fallen in. Very little is to be

Disused mines.

seen of the Biliwala mine, and some others are mere holes, or are entirely covered up now, such as—

Fakira-ki-truddi.
Matwala.
Lawala.
Shaho, &c., &c.

91. "The vertical section through the 4 surveyed mines show the workable salt-seams which are now known, in the following order from above downwards :—

		SALT.	SALT MARL.
		Feet.	*Feet.*
Baggi mine—Upper seam	...	25	...
Marl seam	...	...	10
Middle seam	...	100	...
Marl seam	...	...	25
Lower seam	...	50	...
Between Baggi and Sajiwal, marl	...	...	100
Sajiwal mine—Sajiwal seam	...	50	...
Between Sajiwal and Pharwala, marl	...	...	140
Pharwala seam	...	50	...
TOTAL THICKNESS	...	275	275

92. "The Makhad salt-seam has only been surveyed to about 30 feet thick, but it is doubtless the upper and eastern continuation of the Sajiwal salt-seam.

Workable salt-seams.

93. "There are 5 workable salt-seams, with an aggregate thickness of 275 feet. Between these lie salt marl strata, and thin, unworkable salt-seams, in all at least 275 feet thick, making a total thickness of 550 feet. To these we may add 50 feet of marl over the Upper Baggi salt-seam, and thus estimate the whole thickness of the known strata to be equal to 600 feet. It is, however, not quite certain if some of these strata may not in future be found to be identical with each other. It is certain, however, that the Pharwala seam is not identical with that of Sajiwal or Makhad, because the Pharwala mine lies immediately below the Makhad mine. Yet there may be a relation between the Sajiwal and Baggi salt-seams. The Sajiwal seam may not actually be connected with the Baggi seams, yet the former might be a detached part of the latter, separated by a fault in the stratum and yet originally one and the same stratum. If this be the case, we should not have tocount so many seams. The question will probably be decided after a connection has been made between Sajiwal and Baggi. For the working of the mines it is immaterial whether the strata of both are identical or not,

because the manner in which both salt deposits are supposed to extend remains the same in either case. The size of the mines will best be conceived from the quantity of salt which has been excavated. Each cubic foot of excavation we take to equal 1⅓ maunds of salt. It is not less than this, because the wasted small salt which lies on the floor of the mines is already deducted and is not added to the excavated space. The following are the dimensions and contents of the 4 surveyed mines:—

Dimensions and contents of the 4 surveyed mines.

Mine.	Baggi.	Sajiwal.	Phar-wala.	Makhad.
Length parallel to the strata in feet ...	350	800	800	400
Width in the slope in feet ...	125	350	125	150
Thickness of the excavated stratum in feet,	192	30	30	30
Cubical contents ...	8,400,000	8,400,000	3,000,000	1,200,000
One-fourth deducted for pillars ...	2,100,000	2,100,000	...	...
Remaining cubical contents ...	6,300,000	6,300,000	3,000,000	1,200,000
Maunds of salt (1⅓ per 1 cubic foot) ...	8,400,000	8,400,000	4,000,000	1,600,000

Total of maunds in the 4 mines ... 22,400,000, equal to 16,800,000 cubic feet of excavated space.

94. "Under British rule, from 1850 up to 1870, there has been a quantity, amounting to 154 lakhs of maunds, taken out. This, however, has not been procured from these 4 mines only; a large quantity has also been extracted from Chingwala and other inferior mines.

Quantity of salt extracted under British rule.

95. "There is a large quantity of small salt lying waste in the mines, because the traders cannot use it. The now accumulated small salt, as well as all that will result from the future excavations, would at once come into use when railway communication should be established. From Sajiwal alone, at the very least, 15 lakhs of fine salt could be extracted, with no further expense than that of removal.

Small salt now unused will be utilized in future.

96. "Taking into account all the other small mines, we may estimate the whole amount of salt taken out of the Mayo Salt Mines Hill up to the present time at 300 lakhs of maunds."

Estimate of salt obtained from the Mayo Hill Mines.

97. Of the rest of the Report of Dr. Warth's, the following *résumé* is given in the Manual of Indian Geology, Volume III :—

98. "Since Dr. Warth took charge, great improvement has been effected, though improvements upon the old systemless plan of working were of course in progress ever since the British rule began, as evidenced by the very names of workings like "Thompson's drift," "Purdon's tunnel," "Mathew's drift," &c. Only a few years since, entrance to the mines was gained down a slippery incline, or through an adit, but now one can drive in upon a tramway, through a spacious passage, and observe a system of regular pillars and openings, with various inclined and other drifts, leading to a main passage, through which the salt is taken out of the mine in trucks. In former days, the two principal mines here (the Baggi and Sajiwal mines) were disconnected, and both of them ill-ventilated : a passage has now been open from one to the other, which not only gives a fine rush of air through the mines, but offers an additional means of escape for the numerous workmen in case of danger.

Improvements.

99. "The old chambers, however, still remain to contrast with the new system, and when lighted up the effect of these great caverns is very picturesque, particularly under the influence of colored lights or that from the magnesium lamp; but it is only in very strong light that the brilliant reflections from the facets of crystals become at all prominent, though frequently spoken of by previous writers, before blasting powder was so much used ; nor are stalactitic masses so common as one might expect."

100. "The method of working in these Baggi and Sajiwal mines is described by Dr. Warth in his first paper previously referred to, from which the following is condensed :—

101. "'The miners work in three different ways in the Baggi mine. First forward from a certain floor into the rock-salt. This is called the *katti*, and is the most troublesome. It is nearly as hard as cutting drifts, there being a good deal of pick-work before the men can blast. As the *katti*, is carried forward, they gradually work the roof down, sitting upon tripods, some of which are 25 feet high. This is called *chhat** work. When they have advanced with the *katti* and *chhat*, they begin to work from behind downwards. This is called the *par* or deep working. This *par* ought to be very easy work, but it is not because from want of

Method of working.

* From the word pronounced "chatt," meaning roof or cealing.

space it cannot be carried on in regular advancing steps; instead of this the miners work the *par* directly downwards over areas marked out to them, both in the Baggi and Sajiwal mines.'

Present system.

" Dr. Warth proposed to operate in a contrary manner, namely, to work the *katti* on the roof of the salt seam, and the remaining salt down to the bottom as *par* by steps. The improvements are being gradually carried out, and the appearance of the mine is yearly changing in consequence, so that in course of time there is little doubt the system will become as perfect as possible. Not very long ago gunpowder was never used; now its advantages are fully felt, and Dr. Warth has fired some large blasts separating hundreds of maunds of the salt at once with perfect safety.

103. " From one of the smaller mines called Pharwala, men, women, and children had carried full 40 lakhs of maunds of salt up a narrow steep and crooked drift, and from the whole Mayo Mines Dr. Warth estimates the gross amount of salt removed at 300 lakhs of maunds; but notwithstanding the length of time these mines have been extensively worked, and though each season adds a concentric belt to the excavated area, they show as yet no signs of becoming exhausted.*

Wire tramway.

104. " In order to facilitate the carriage of the salt from the mines, Dr. Warth's tramway was extended to the mouth of the gorge, and thence a wire-rope tramway was constructed under the superintendence of Lieutenant DeWolski, R. E., to the village of Chak Nizam, on the southern bank of the Jhelum, above Pind Dadan Khan, and 10 miles from the Khewra gorge. This has been for some years completed, and is occasionally in working order, but difficulties have had to be contended with in the unusual length of the line, and the effect of the water of the country upon the boilers of the engines that supply the motive power. When fairly at work, this tramway will be an important aid in the rapid distribution of the salt by means of the Northern State Railway.

Sardi mines.

105. "The Sardi mines to the west (10 miles or so north-westward from Pind Dadan Khan) are smaller and less favorably situated for working, being sunk below the bottom of the glen instead of in a hillside like those of Khewra.

* For very full descriptions of the mines, modes of working, outturn, &c., Dr. Warth's papers may be referred to.

They were more recently opened than the latter, and were originally constructed on a better plan, flights of steps being cut out of the salt, and the roofs supported. Owing to their low situations they have been at times stopped by access of water, and they are now altogether closed.

Wurcha mine.

106. "The Varcha (or Wurcha) mine is in the hill on the right hand side of the Varcha gorge, about 30 miles west-north-west from Shahpur. The mine is at a considerable elevation, and is large, though only about 20 feet of salt are excavated out of a bed of much greater thickness,* the remainder of which is not sufficiently good for commercial purposes at the Salt Range. There are large remains of old Sikh workings and great natural shafts or vertical water-courses. The old workers here, as elsewhere, left the roof unsupported, and it is falling in, but in the modern mine this is provided against. Whilst the salt-bed continues to dip as it at present does 20° to north-west, no alteration in the mode of working (according to Dr. Warth) will be needed. The mine is well ventilated and clean, and has two modes of ingress, but no low-level water-escape.

107. The total quantity of salt available for use was calculated by Dr. Warth in 1870 to be 2,000 lakhs of maunds.

Total quantity of salt obtainable from the new fields.

108. "The total quantity of salt available from the new proposed workings is—

Baggi	...	...	...	150 lakhs maunds.
Sajiwal	...	...	...	75 " "
Pharwala	...	...	...	25 " "
	Altogether	...		250 lakhs of maunds of salt.

Sufficient to last for 25 years.

This quantity, at the present rate of selling, would last 25 years. For this period of time the supply is secured, in already known salt-seams. What other supplies we shall get after that time, we can only guess. Considering that, as above stated, the quantity which has already been extracted is equal to 300 lakhs maunds, one would take the whole quantity of salt which must yet be available in the salt-hill, above the level of the gorge, to be 1,000 lakhs of maunds. The continuation of the salt-hill, on the right side of the Khewra gorge, the Linda

* Dr. Warth remarks that the salt mines of Cheshire are being excavated in the same thickness as the Varcha bed, namely 20 feet.

and Giteali, may yet contain much more salt than the old hill, according to geological surmise.

Total supply available sufficient to last for 200 years.

109. "But if we only take 1,000 lakhs for granted, the whole available quantity at Khewra amounts to 2,000 lakhs, and secures the present supply of the mines for 200 years."

Alterations since 1870.

110. The chief improvements which have been made in the mines during the past few years are as follows. The old parts of the Baggi and Sajiwal mine have been abandoned as unsafe. The 1,000 feet drift has been prolonged, and other drifts have been made for its ventilation; these operations led to the discovery of fresh bands of salt, which will materially increase the estimate of the supply above quoted. Working has been gradually given up on the lower levels, and transferred to the upper levels of the mines in order that the salt may be excavated downwards. Channels have been constructed on the outer surface of the hills in order to carry off the rain water as fast as it falls and prevent its permeating into the interior.

Failure of wire tramway across the river.

The wire tramway which was constructed in 1874-76 at a cost of 3 lakhs of rupees was intended to supply a new depôt at Chak Nizam on the south bank of the Jhelum river, over which it conveyed the salt. A branch line however has been constructed from the station of Lala Musa on the Punjab Northern State Railway to Miani, opposite Pind Dadan Khan, and a light line has this year been completed from the mines to the banks of the river. There will therefore be little or no difficulty in the transport of salt hereafter, and this will no doubt have the effect of lowering its price to some extent. The salt crosses the Jhelum river by means of the bridge-of-boats in the cold weather, and by ferry boats in the summer months. The waggon tramways inside the mines, by which the salt is brought down to the depôt at Warthganj at their mouths, have been a great success, and they have now been extended to all parts where important excavations are carried on: formerly a great deal of the salt had to be carried to the main line of tramway on men's backs and heads, and much time was lost thereby.

Branch railway line from Lala Musa to Miani.

Tramways inside the mines.

111. In consequence of the construction of the railway and the supersession of the use of the roads along which the salt was formerly carried, the cess of 2 pies per maund which was formerly levied from traders at the mines in order to keep the roads in good condition has this year been abolished.

Miners.

112. The miners live almost entirely in Khewra. The original miners belong to the Awan and Jat tribes, but a number of others from the village artisan classes have taken to the occupation since the advent of the British rule. Their numbers have increased rapidly of late years, and there is already difficulty in giving full employment to all of them. The class is not well-to-do as a whole, but has generally been contented since 1870. In 1863 a somewhat serious strike took place, the miners complaining that they had been deprived of certain rights of cultivation and grazing in the rakhs adjoining the mine, and resenting the closing of certain works which restricted the employment of the men for a time. Under the Sikh Government the miners were allowed to work where they pleased and as they pleased. This system could not of course be continued under the British Government; but in seeking to regulate the operations of the laborers, misunderstanding occurred and hardships were undoubtedly caused. A full report on the subject was submitted by Colonel Cracroft, Commissioner of the Rawalpindi Division, and the orders which were issued by the Punjab Government had the effect of allaying the excitement of the men, who returned to their work. In addition to the rights of grazing which were then conceded to the miners, an area of 2,000 acres of waste land was made over to them in 1872 and 1875 for cultivation, on the recommendation of the Commissioner of Customs. The land is held by the miners on sub-leases subject to good conduct, the actual lease being in the name of the Deputy Collector of Customs, at Khewra.

Strike in 1863.

Grant of lease of land to the miners.

Changes in system of mining.

113. The system of mining has been described above in the extract from the Manual of Indian Geology. Formerly roof and floor excavation were paid for at different rates, but in 1879-80 a change was made in this respect, which is thus described in the Salt Revenue Administration Report of that year.

114. "The new scheme of commencing with chambers throughout the higher levels and so gradually working downwards necessitates a large amount of 'katti' or roof excavation for next year; and the proportion between 'katti' and 'par,' which has hitherto been considered desirable, can no longer be maintained. Enquiry has shown that the miners would just as soon work 'katti' as 'par' if they are allowed to work the 'katti' 10 feet vertically instead of 7 feet as heretofore, 10 feet really requiring no more labor than the 7 feet; and the time had come when it seemed advisable to adopt a uniform rate for both 'katti' and 'par.' The opening of the new tramway on the upper level will immensely facilitate the carriage of salt for the miners and be a considerable saving of money to them. On the other hand, the carrying contractor who works the tramways will have to be paid for the increased work put upon him. Up to the present time he has been paid for the carriage of the salt from the loading stations to the mines' mouth by the miners, and there is no reason for altering this arrangement; the miners will, however, have to pay for the additional carriage, and it has been therefore determined to alter the rates which were fixed in 1872 from 1 anna per cubic foot for 'katti' and 8 pies per cubic foot for 'par' to a uniform rate of 8·5 pies per cubic foot for all work.

Distinction between kinds of excavation abolished and change in system established.

115. "The miners appear perfectly satisfied with this arrangement, which will simplify the accounts, enable the officer in charge of the mines to conduct his operations without reference to the relative quantities of 'katti' and 'par,' to which he was bound by former orders, and, whilst still keeping the price below Rs. 4 per 100 maunds, give the miners a considerable addition to their wages and at the same time give the Department a small additional margin towards the improvement fund.

Miners satisfied and accounts simplified.

116. "Under this arrangement the Inspector also will be able to insist still more on care being taken not to send out of the mine refuse salt and marl."

117. In the following year the system was perfected, and now the mine officer not only measures each man's space, but he distributes the spaces, prepares each man's account, and pays each man in his presence; there is now nothing left to Native subordinates, and the miners, it is said, were never so well off as they are now. The following description of the miners and their condition is taken from the *Jhelum Gazetteer.*

118. "Men, women and children indiscriminately pursue the avocation of salt miners. Families generally work together, the mother and children being chiefly occupied in carrying on their backs to the mouth of the mine the masses of salt which the father has quarried.

Work.

119. "The pay of the miners varies a good deal. At Khewra, Makhrach and Varcha, salt is turned out at the mouth of the mines at the rate of Rs. 3-12-0 for 100 maunds = £0-7-6 for 8,000 lbs. At Sardi they receive Rs. 2-14-0 = 5*s*., while at Kalabagh, where the salt occurs in enormous masses at the surface and only requires to be broken up and removed, they receive Rs. 2-14-0 for quarrying it, and Re. 1-5-0 per 100 maunds for conveying it to the depôt at Mari: oil and tools are supplied by the miners themselves.

Wages.

120. "The quantity of salt that can be turned out in a day by a good workman is about 20 maunds, which give the miners about 8 annas a day. But from this gross wage certain deductions have to be made, and moreover the men do not work regularly the whole year round. Where, however, a family works together, the earnings amount to something considerable.

121. "The general appearance of the miners varies greatly. At the end of the hot season they appear very sickly and sallow, but towards the close of the cold season they do not appear to have a more unhealthy aspect than the inhabitants of towns in the Punjab generally have. They, however, suffer a good deal from sickness, but this is probably owing more to the position of their villages and their filthy habits than to their trade. Certain diseases, such as ophthalmia and pulmonary complaints, are very prevalent among them, and doubtless result from the injurious effect of the finely powdered salt acting as an irritant on the mucous membranes. Fever is very prevalent among the miners at the Khewra, where (perhaps from the confined position of their mine) they look more sickly than at most of the other mines."

Appearance.

122. Accidents are rare, and when they do occur are due almost entirely to the carelessness of the miners. In the Sikh times the tunnels used to be driven into the hill without any supports and were exceedingly dangerous, and in consequence many of the old mines have been abandoned. The galleries are now driven, although parallel to the strata in the strike or across them in

Accidents.

the fall, and the pillars left are rectangular in shape with sides parallel to the strike and the fall. Since 1876-77 only 5 deaths have been caused by accidents ; of these 2 were connected with the tramway, one occurring from foolhardiness, and the other from an unlucky slip by a coolie ; in one case a miner blew himself up while lighting a fire, and in another a child was killed by an accidental explosion caused by its mother allowing a lamp to fall on a flask of powder ; in the fifth instance a carpenter, attempting to leave the mine without a light, fell into a deep chamber and was killed.

Jhelum salt trade inelastic.

123. In spite of the very pure quality of the salt, and in spite of the reduction in the cost of excavation and in rate of duty, the Jhelum salt trade shows itself singularly inelastic. The fair average composition of the salt is said to be as follows :—

Earthly matter.		Trace.
Sulphate of Lime	...	0·75
Chloride of Calcium	...	0·50
" of Magnesium	...	1·25
" of Sodium	...	93·00
Water and loss	...	4·50
Total	...	100·00

124. The cost of excavation of 100 maunds of salt in 1869 and of its carriage to the depôt was put at Rs. 4 ; in 1881-82 the same cost was put at Rs. 2-14-2. The reduction of duty did not come into force till March last, and it is perhaps early to judge of its effect as yet ; but it is understood that up to the present time it has not stimulated the demand for Jhelum salt to any marked degree.

125. During the 4 years ending with 1870-71 the average output of salt, including the Kalabagh mines, was 1,291,148 maunds, and during the 4 years ending with 1880-81, 1,455,199 maunds ; the average revenue realized by Government was in the former case Rs. 38,89,192, and in the latter Rs. 39,18,737. But though the trade is at present inelastic, it made immense strides after the railway was first opened from Lahore to the south of India. In 1848-49 only 3½ lakhs of maunds were excavated, on which the duty realized amounted to Rs. 8,06,000 ; while 32 years later, in 1881-82, the output was 1,400,000 maunds and the revenue Rs. 37,00,000, or about 4 and a half times

greater. The principal railway stations to which Jhelum salt is sent are as follows :—

		Maunds.
Stations north of Wazirabad	...	45,000
„ between Wazirabad and Lahore	...	213,000
„ „ Lahore and Amritsar	...	116,000
„ „ Amritsar and Jullundur	...	90,000
„ „ Jullundur and Ludhiana	...	155,000
„ „ Ludhiana and Umballa	...	171,000
„ „ Umballa and Delhi	...	96,000
Total	...	886,000

126. Comparatively little Jhelum salt is despatched outside the Province.

127. The wholesale price of Jhelum salt in the month of May last is stated in last annual report on the Salt Administration to have been Rs. 2-10-0 per maund in Amritsar and Lahore, Rs. 2-8-0 in Mooltan, to which it is conveyed by boat, and Rs. 2-12-0 nearly in Ludhiana; this gives a selling price of 15 seers for the rupee. According to the last issue of the *Punjab Gazette* the prices for the fortnight ending 15th September 1882 were :—

Districts.	Salt. Quantity per Rupee. Present fortnight ending 30th September 1882. Wholesale. S.	C.	Retail. S.	C.	Last fortnight ending 15th September 1882. Wholesale. S.	C.	Retail. S.	C.	Corresponding fortnight of 1881. S.	C.
Delhi	12	8	11	8	12	8	11	8	11	8
Gurgaon	12	0	12	0	12	0	12	0	10	0
Karnal	11	8	11	4	11	8	11	4	10	0
Hissar	11	0	10	0	10	8	10	0	10	0
Rohtak	11	5	10	12	11	1	10	5	10	8
Sirsa	11	0	10	8	11	0	10	8	9	0
Umballa	13	13	13	12	13	12	13	8	11	0
Ludhiana	14	10	14	8	14	10	14	8	11	8
Simla	10	0	9	6	10	8	9	14	8	0
Jullundur	14	4	13	11	14	4	13	4	11	8
Hoshiarpur	14	0	13	8	13	12	13	8	11	8

Districts.	Salt.									
	Quantity per Rupee.									
	Present fortnight ending 30th September 1882.				Last fortnight ending 15th September 1882.				Corresponding fortnight of 1881.	
	Whole-sale.		Retail.		Whole-sale.		Retail.			
	S.	C.	S.	C.	S.	C.	S.	C.	S.	C.
Kangra	10	8	10	0	10	8	10	0	9	0
Amritsar	14	12	14	6	14	12	14	6	12	4
Gurdaspur	13	8	13	0	13	8	13	0	10	8
Sialkot	14	12	14	0	15	0	14	0	12	4
Lahore	15	0	12	0	15	0	14	0	10	8
Gujranwala	15	4	15	0	15	4	15	0	12	4
Ferozepore	12	0	12	0	13	0	13	0	11	0
Rawalpindi	14	6	14	4	14	12	14	8	12	2
Jhelum	16	8	16	0	16	8	16	0	13	0
Gujrat	*		15	0	*		15	0	12	8
Shahpur	17	0	16	0	17	0	16	0	14	0
Mooltan	15	0	14	8	14	12	14	8	12	0
Jhang	15	2	15	0	15	4	15	0	12	8
Montgomery	12	0	11	0	12	0	11	0	10	0
Muzaffargarh	*		12	0	*		12	0	11	8
Dera Ismail Khan †	55	0	53	0	55	0	53	0	50	0
Dera Ghazi Khan †	30	10	27	8	31	4	27	8	25	5
Peshawar ... †	55	4	53	0	55	4	53	0	38	12
Hazara ... †	...		11	0	12	0	12	0	10	0
Kohat ... †	91	8	75	0	96	15	84	0	51	0

* No wholesale salt sold.

† Frontier salt from the Kohat Salt Mines.